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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Sigrid Buhler

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ALEXANDRIA, VA 22314

EXAMINER

LAU, JONATHAN S

ART UNIT

PAPER NUMBER

1623

NOTIFICATION DATE

DELIVERY MODE

05/08/2008

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/764,989	<b>Applicant(s)</b> BUHLER ET AL.	
	<b>Examiner</b> Jonathan S. Lau	<b>Art Unit</b> 1623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 13 February 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-46 is/are pending in the application.
- 4a) Of the above claim(s) 18-29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 3-17 and 30-46 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 13 Feb 2008 has been entered.

This application is a domestic application, filed 26 Jan 2004; and claims benefit of provisional application 60/449,070, filed 21 Feb 2003.

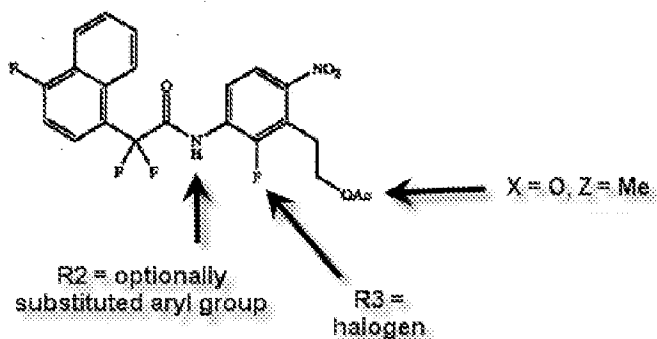
Claims 1 and 3-46 are pending in the current application. Claims 18-29, drawn to non-elected inventions, are withdrawn. Claims 1, 3-17 and 30-46 are examined on the merits herein.

This Office Action is responsive to Applicant's amendment and remarks, filed 13 Feb 2008.

### ***Rejections Withdrawn***

Applicant's remarks, filed 13 Feb 2008, with respect to rejection of claim 1 under 35 U.S.C. 102(e) as being anticipated by Pan et al. (U.S. Patent No. 6,900,231; of record) has been fully considered and is persuasive. Note that the compound disclosed

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by Pan et al. is interpreted as:

, wherein

R1 and R4 are H, and Z is the leaving group Methyl. Applicant's remarks sets clear on the record that the plain language of the claim requires that the R<sup>2</sup> group is limited to an aryl, heteroaryl, or aroyl group directly bonded to the disclosed phenyl ring, ie. in the case of aryl a carbocyclic aromatic radical, and does not encompass groups that are connected by an optional substituent group.

This rejection of claim 1 has been **withdrawn**.

Applicant's remarks, filed 13 Feb 2008, with respect to rejection of claims 30, 31, 35-39, 45 and 46 under 35 U.S.C. 102(b) as being anticipated by Eritja et al.

(Tetrahedron 1992; of record) has been fully considered and is persuasive. Applicant's remarks that the ordinary definition of alkyl requires at least one carbon and therefore the compound disclosed by Eritja et al. does not anticipate the claimed invention are convincing. However, the property disclosed by Eritja et al. that the protecting groups are cleaved by treatment with a basic compound does not negate the inherent property that the protecting groups disclosed by Eritja et al. are capable of being cleaved by photolysis.

This rejection of claim claims 30, 31, 35-39, 45 and 46 has been **withdrawn**.

Applicant's remarks, filed 13 Feb 2008, with respect to rejection of claims 30-46 under 35 U.S.C. 103(a) as being unpatentable over Pfeiderer et al. (U.S. Patent No. 5,763,599, of record) has been fully considered and is persuasive. Applicant's remarks that the compound disclosed by Pfeiderer et al. alone does not disclose or suggest modification of the R<sup>1</sup> position to be the group COOY as required by instant claim 30 are convincing.

This rejection of claim claims 30-46 has been **withdrawn**.

Applicant's remarks, filed 13 Feb 2008, with respect to rejection of claims 30-46 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Pfeiderer et al. (U.S. Patent No. 5,763,599, of record) has been fully considered and is persuasive. Applicant's remarks that the compound disclosed by Pfeiderer et al. alone does not disclose or suggest modification of the R<sup>1</sup> position to be the group COOY as required by instant claim 30 are convincing. Comparisons between the '599 patent and instant claims "1,2-17" (sic) (page 5 of Office Action mailed 13 Sep 2007) were made for reference purposes only, as only claims 30-46 were rejected on the ground of nonstatutory obviousness-type double patenting.

This rejection of claim claims 30-46 has been **withdrawn**.

The following rejection is modified to withdraw the rejection of canceled claim 2 and otherwise reiterated and maintained.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Amended claims 1, 3-17 and 30-46 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1, from which claims 3-17 depend, recites "optionally substituted" in reference to alkyl, alkoxy, aryl, and aroyl heteroaryl groups. Claims 3 and 4 additionally recites "optionally substituted" in reference to phenyl and benzyl. The specification does not clearly define or point out what type of groups will be used in substitution and in what positions the substitutions will occur. As such, said recitation renders the claims indefinite. Claim 30, from which claims 31-46 depend, recites "optionally substituted" in reference to alkyl, alkoxy, aryl, and aroyl heteroaryl groups.

Regarding amended claim 13, the claim recites the phrase "intermediate OH-protective group". Said phrase does not convey a structural formula or chemical name to one of ordinary skill in the art. In the absence of a structural formula or chemical name one of ordinary skill in the art would not be apprised of the metes and bounds of claimed invention.

As indicated in the previous office action, the phrases "a functional group useful in oligonucleotide synthesis", "chemically modified", "analog thereof", and "chemical modifications thereof" does not convey any structural features to one of skill in the art. Applicants argue that "analog of deoxyribonucleosides, ribonucleosides,

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deoxyribonucleosides, and ribonucleotides are well-known in the art." Applicants argue that there might be some compounds that might be some examples in the art of analogs. However, definition by exemplification does not convey to one of skill in the art the metes and bounds of the claimed invention. In regards to the phrase "chemically modified", the applicants points to definitions section in specification, Page 12, lines 22- page 13, line 11". The referred sections of the specification is a definition for "oligonucleotide", in which the term "oligonucleotide" is defined to include chemical modifications. The specification states that, "Modifications include, but are not limited to" a list of chemical reactions. There are no limiting definitions in the specification. Since the chemical modifications are only exemplified, and one of skill in the art will not readily know which reactions are included and which are excluded, the metes and bounds of the claims herein are not clearly defined. The phrase "a functional group useful in oligonucleotide synthesis" is also not clearly defined so that one of skill in the art will be apprised of the metes and bounds of the claimed invention herein. For the above reasons claims 1 and 3-17 and 30-46 are considered properly rejected under 35 USC 112 second paragraph, in regards to phrases, "a functional group useful in oligonucleotide synthesis", "chemically modified", "analog thereof", and "chemical modifications thereof."

The following are new grounds of rejection.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

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The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Amended claims 1, 3-17 and 30-46 are rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had full possession of the claimed invention. Claims 1, 3-17 and 30-46 recite the terms "substituted," "leaving group," "photolabile protective group," "functional group useful in oligonucleotide synthesis," "protective group useful in oligonucleotide synthesis," "chemical modifications thereof," "chemically modified," and "analog" used to describe a chemical compound.

The specification discloses chemicals, such as aryl groups "substituted" with an alkyl group (page 11, line 20), "leaving groups" such as imidazolyl (page 12, line 16), and "analogs" or "chemically modified" compounds such as 5-position pyrimidine modifications (page 12, line 20), and fully described compounds such as disclosed on table 1 of page 53, which meet the written description and enablement provisions of 35 USC 112, first paragraph. However, claims 1, 3-17 and 30-46 are directed to encompass compounds described by the terms "substituted," "leaving group," "photolabile protective group," "functional group useful in oligonucleotide synthesis," "protective group useful in oligonucleotide synthesis," "chemical modifications thereof," "chemically modified," and "analog", which only correspond in some undefined way to specifically instantly disclosed chemicals. None of these compounds meet the written description provision of 35 USC § 112, first paragraph, due to lacking chemical

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structural information for what they are and because chemical compounds are highly variant and encompass a myriad of possibilities. The specification provides insufficient written description to support the genus encompassed by the claims. Exemplary definitions are provided for the terms, for example spanning pages 11-13, however no limiting definition is provided for these terms. Applicant's remarks, filed 15 Dec 2006, page 30 recite "As such, it is therefore neither possible nor necessary to list explicitly all theoretically conceivable "leaving groups."", emphasis added, as the scope of the claimed genus is so broad that simply listing it is not possible.

Vas-Cath Inc. v. Mahurkar, 19 USPQ2d 1111, makes clear that "applicant must convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession *of the invention*. The invention is, for purposes of the 'written description' inquiry, *whatever is now claimed*." (See page 1117.) The specification does not "clearly allow persons of ordinary skill in the art to recognize that [he or she] invented what is claimed." (See Vas-Cath at page 1116.)

With the exception of the above specifically disclosed chemical structures, the skilled artisan cannot envision the detailed chemical structure of the encompassed derivatives, analogs, etc., regardless of the complexity or simplicity of the method of isolation. Adequate written description requires more than a mere statement that it is part of the invention and reference to a potential method for isolating it. The chemical structure itself is required. See Fiers v. Revel, 25 USPQ2d 1601, 1606 (CAFC 1993) and Amgen Inc. V. Chugai Pharmaceutical Co. Ltd., 18 USPQ2d 1016. In Fiddes v. Baird, 30 USPQ2d 1481, 1483, claims directed to mammalian FGF's were found

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unpatentable due to lack of written description for the broad class. The specification provided only the bovine sequence. Finally, University of California v. Eli Lilly and Co., 43 USPQ2d 1398, 1404, 1405 held that:

...To fulfill the written description requirement, a patent specification must describe an invention and do so in sufficient detail that one skilled in the art can clearly conclude that "the inventor invented the claimed invention." *Lockwood v. American Airlines, Inc.*, 107 F.3d 1565, 1572, 41 USPQ2d 1961, 1966 (1997); *In re Gosteli*, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989) ("[T]he description must clearly allow persons of ordinary skill in the art to recognize that [the inventor] invented what is claimed."). Thus, an applicant complies with the written description requirement "by describing the invention, with all its claimed limitations, not that which makes it obvious," and by using "such descriptive means as words, structures, figures, diagrams, formulas, etc., that set forth the claimed invention." *Lockwood*, 107 F.3d at 1572, 41 USPQ2d at 1966.

Therefore, only the structurally defined chemical compounds, but not the full breadth of the claims, meet the written description provision of 35 USC § 112, first paragraph. The species specifically disclosed are not representative of the genus because the genus is highly variant. Applicant is reminded that Vas-Cath makes clear that the written description provision of 35 USC § 112 is severable from its enablement provision. (See Vas-Cath at page 1115.)

The court of *In re Curtis* held that "a patentee will not be deemed to have invented species sufficient to constitute the genus by virtue of having disclosed a single species when... the evidence indicates ordinary artisans could not predict the operability ... of any other species." (see *In re Curtis* 354 F.3d 1347, 69 USPQ2d 1274, Fed. Cir. 2004). The court of *Noelle v. Lederman* also pointed out that generic claim to anti-CD40CR Mabs lacked written description support because there was no description of anti-human or other species Mabs, and no description of human CD40CR antigen.

The court further pointed out that attempt to “define an unknown by its binding affinity to another unknown” failed. See 355 F.3d 1343, 69 USPQ2d 1508, Fed. Cir. 2004.

Therefore, because the genus of compounds encompassed by compounds described using the terms “substituted,” “leaving group,” “photolabile protective group,” “functional group useful in oligonucleotide synthesis,” “protective group useful in oligonucleotide synthesis,” “chemical modifications thereof,” “chemically modified,” and “analog”, the specification provides insufficient written description to support the genus that is being claimed.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Amended claims 1, 3-17 and 30-46 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Amended claims 1 and 30 recite “Z is selected from the group ... of a compound comprising the photolabile protective group, or a deoxyribonucleoside or a ribonucleoside as represented by either of the following formulae (2) or (3):...”. The language “compound comprising” renders the claim indefinite because the open language of “comprising” means it is unknown what the compound comprises in addition to the part of the compound represented by a chemical formula such as (2) or (3). Therefore independent claims 1 and 30 fail to particularly point out and distinctly

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claim the subject matter which applicant regards as the invention and dependent claims, and dependent claims 3-17 and 31-46 do not remedy this indefiniteness.

Amended claims 1 and 30 recite the limitation "the photolabile protective group" in line 18 of claim 1 and line 14 of claim 30. There is insufficient antecedent basis for this limitation in the claims. It is unclear what photolabile protective group is referred to in these claims. Therefore independent claims 1 and 30 fail to particularly point out and distinctly claim the subject matter which applicant regards as the invention and dependent claims, and dependent claims 3-17 and 31-46 do not remedy this indefiniteness.

Amended claims 8-11 recite the limitation "protective group" in line 2 of claim 8, line 2 of claim 9, line 2 of claim 10, and line 2 of claim 11. There is insufficient antecedent basis for this limitation in the claim. Claim 1 recites multiple protective groups, and it is unclear which protective group is referenced in claims 8-11.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

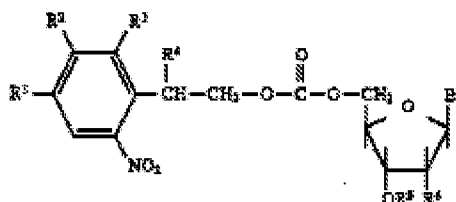
This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

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were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Amended claims 1, 3, 5 and 7-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pfeleiderer et al. (US Patent 5,763,599, issued 09 Jun 1998, of record) and Fodor et al. (US Patent 5,489,678, issued 06 Feb 1996, cited in PTO-892).

Pfeleiderer et al. discloses compounds of the formula



(numbering the same as the instant formula) in

which R1 = H, NO<sub>2</sub>, CN, OCH<sub>3</sub>, halogen or alkyl or alkoxyalkyl having 1 to 4 C atoms; R2 = H, OCH<sub>3</sub>; R3 = H, F, Cl, Br, NO<sub>2</sub>; R4 = H, halogen, OCH<sub>3</sub>, or an alkyl radical having 1 to 4 C atoms; R5 = H or a usual functional group for preparing oligonucleotides; R6 = H, OH, halogen or XR<sub>8</sub>, where X = O or S and R<sub>8</sub> represents a protective group usual in nucleotide chemistry; and B = adenine, cytosine, guanine, thymine, uracil, 2,6-diaminopurin-9-yl, hypoxanthin-9-yl, 5-methylcytosin-1-yl, 5-amino-4-imidazolcarboxamid-1-yl, or 5-amino-4-imidazolcarboxamid-3-yl, where in the case of B=adenine, cytosine or guanine, the primary amino function optionally exhibits a permanent protective group (abstract). Pfeleiderer et al. discloses compounds with

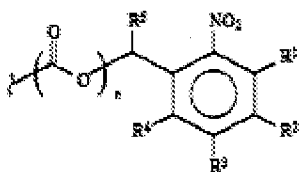
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phosphoramidite substituents at the R5 position (Claim 1, Column 28; lines 37-67 Column 24-25, Summary of the Preparation Examples, Compounds 15-17). The substituents at the R3 and R4 position are identically disclosed as the instant application. (Column 28, lines 50-60; Claim 1). The substituents R5 and R6 have significant overlap with the instant application. (Column 28, lines 57-67; Claim 1).

Pfleiderer et al. discloses substitution of Sulfur and Oxygen at the R6 position as well as the use of protecting groups including silyl groups for oxygen. In particular, alkyl, alkenyl, acetal, S-alkyl, O-Methyl, O-ethyl, O-alkenyl O-allyl, O-acetal and O-tetrahydropyranyl groups are disclosed. (Column 28, lines 37-67, Claim 1; Column 2, lines 52-65). Pfleiderer et al. discloses the use of the bases adenine, cytosine and guanine, and the protective groups p-NPEOC and ethylformamidino. (Column 29, lines 30-40, claims 10,11 and 13).

Pfleiderer et al. does not specifically disclose compounds wherein R2 is selected from the group consisting of an optionally substituted aryl group, an optionally substituted heteroaryl group or an optionally substituted aroyl group.

Fordor et al. teaches photolabile nucleoside protecting groups of the formula



where R1, R2, **R3** (corresponding to R2 of the instant formula),

and R4 independently are a hydrogen atom, a lower alkyl, **aryl**, benzyl, halogen, hydroxyl, alkoxyl, thiol, thioether, amino, nitro, carboxyl, formate, formamido or phosphido group, or adjacent substituents (i.e., R1 -R2, R2 -R3, R3 -R4) are substituted

oxygen groups that together form a cyclic acetal or ketal (column 19, lines 50-67).

Fordor et al. teaches "The removal rate of the protecting groups depends on the wavelength and intensity of the incident radiation, as well as the physical and chemical properties of the protecting group itself. Preferred protecting groups are removed at a faster rate and with a lower intensity of radiation. For example, at a given set of conditions, MeNVOC and MeNPOC are photolytically removed from the N-terminus of a peptide chain faster than their unsubstituted parent compounds, NVOC and NPOC, respectively." (column 24, lines 45-57) Fordor et al. provides guidance for varying the substituents R1, R2, R3, and R4 because varying the substituents results in protecting groups that are removed at a faster rate (column 25, table in lines 30-40).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the compound disclosed by Pfeiderer et al. with the teaching of Fordor et al. of varying the substituents of the phenyl ring. Both Pfeiderer et al. and Fordor et al. are directed to the field of photolabile protecting groups of nucleosides. Fordor et al. provides guidance for varying the substituents R1, R2, R3, and R4 because varying the substituents results in protecting groups that are removed at a faster rate and teaches "Preferred protecting groups are removed at a faster rate and with a lower intensity of radiation". Therefore it would have been obvious to try, selecting from a finite number of identified, predictable solutions, with a reasonable expectation of success to practice the compound wherein R2 is selected from the group consisting of an optionally substituted aryl group.

**Response to Applicant's Remarks:**

Applicant asserts that Hasan et al., providing evidence of the state of the prior art, teaches away from substitution at the position R1 and R2 of the instant formula. However, it is also noted that Hasan et al. is directed to substitution at the *meta*- (R2 of the instant formula) or *para*- (R1 of the instant formula) with methoxy- or chloro- groups. (Hasan et al., page 4250, 2<sup>nd</sup> paragraph, lines 7-8). Hasan et al. states that the effect of *ortho*-substitution may be due to either inductive or steric effects (Hasan et al., page 4250, 2<sup>nd</sup> paragraph, lines 8-9). Hasan et al. states that *ortho*-substitution with an electronegative substituent reduces the rate while substitution with a larger atom increases the rate (Hasan et al., page 4250, 2<sup>nd</sup> paragraph, lines 4-6). Both methoxy- and chloro- groups are inductively electron-withdrawing, O and Cl being more electronegative than the C of the phenyl ring, and are sterically small. An aryl substituent, such as taught by Fordor et al., is inductively electron-donating and sterically bulky. Therefore, rather than teaching away from substitution at the R2 position of the instant formula with an aryl group, Hasan et al. would indicate that the state of the prior was such that one of skill in the art that to produce a protecting group that is removed at a faster rate one would substitute the R2 position of the instant formula with such an inductively electron-donating and sterically bulky group.

With regard to the statement, "In general substitutions at other positions on the phenyl ring had less effect on photolysis rates." (Hasan et al., page 4247, abstract), this statement does not indicate that changes at R1 or R2 of the instant formula have no positive effect, as Applicant asserts, but rather a smaller effect than the strongest enhancement effects of *ortho*- and  $\alpha$  substitution. Again, it is noted that Hasan et al. is

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directed to substitution at the *meta*- (R2 of the instant formula) or *para*- (R1 of the instant formula) with methoxy- or chloro- groups (Hasan et al., page 4250, 2<sup>nd</sup> paragraph, lines 7-8), inductively electron-withdrawing and sterically small groups.

Amended claims 1 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pfeiderer et al. (US Patent 5,763,599, issued 09 Jun 1998, of record) and Fodor et al. (US Patent 5,489,678, issued 06 Feb 1996, cited in PTO-892) as applied to claims 1, 3-5 and 7-17 above, and further in view of Berlin (DE19938092, published 22 Feb 2001, cited in PTO-892). As DE19938092 is published in German, a machine translation of Berlin is provided.

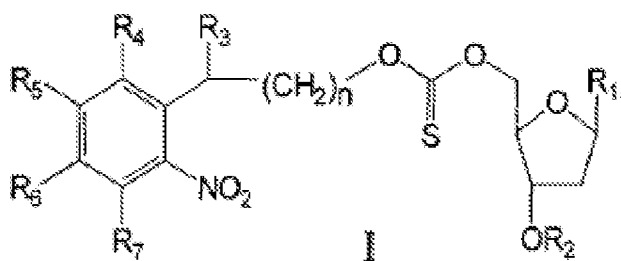
Pfeiderer et al. and Fodor et al. teaches as above.

Pfeiderer et al. and Fodor et al. do not specifically disclose the compound wherein W is S (instant claim 6).

Berlin teaches photo-unstable protecting groups of nucleoside derivatives that that can be split off very efficiently (page 2, lines 4-5 of the machine translation; page 3 lines 39-40 of DE 19938092). Berlin teaches said protecting groups can be manufactured analogous to the esters of carbonic acid (page 2, lines 6-7 of the machine translation; page 3, lines 41-42 of DE 19938092), the compound where W is O

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according to the formula of instant claim 1. Berlin teaches compounds of represented



by the formula

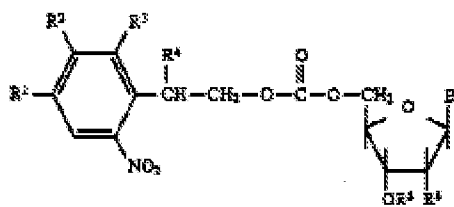
(DE 19938092, abstract).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the compound taught by Pfeleiderer et al. and Fodor et al. with the teaching of Berlin of the compound wherein W is S according to the formula of instant claim 1. All of Pfeleiderer et al., Fodor et al. and Berlin are directed to the field of photolabile protecting groups of nucleosides. One of ordinary skill in the art would be motivated to combine Pfeleiderer et al. and Fodor with the teaching of Berlin because Berlin teaches use of the thiocarbonic group results in a protecting group that can be split off very efficiently. One of ordinary skill in the art would have a reasonable expectation of success in combining Pfeleiderer et al. and Fodor with the teaching of Berlin because of the structural similarities of the compounds and the teaching of Berlin that said protecting groups can be manufactured analogous to the esters of carbonic acid.

Amended claims 30-32 and 34-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pfeleiderer et al. (US Patent 5,763,599, issued 09 Jun 1998, of record) in view of Haugland et al. (US Patent 5,635,608, issued 03 Jun 1997, cited in PTO-892).

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Pfleiderer et al. discloses compounds of the formula



(numbering the same as the instant formula) in

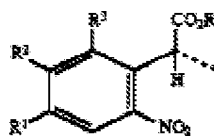
which R1 = H, NO<sub>2</sub>, CN, OCH<sub>3</sub>, halogen or alkyl or alkoxyalkyl having 1 to 4 C atoms; R2 = H, OCH<sub>3</sub>; R3 = H, F, Cl, Br, NO<sub>2</sub>; R4 = H, halogen, OCH<sub>3</sub>, or an alkyl radical having 1 to 4 C atoms; R5 = H or a usual functional group for preparing oligonucleotides; R6 = H, OH, halogen or XR<sub>8</sub>, where X = O or S and R<sub>8</sub> represents a protective group usual in nucleotide chemistry; and B = adenine, cytosine, guanine, thymine, uracil, 2,6-diaminopurin-9-yl, hypoxanthin-9-yl, 5-methylcytosin-1-yl, 5-amino-4-imidazolcarboxamid-1-yl, or 5-amino-4-imidazolcarboxamid-3-yl, where in the case of B=adenine, cytosine or guanine, the primary amino function optionally exhibits a permanent protective group (abstract). Pfleiderer et al. discloses compounds with phosphoramidite substituents at the R5 position (Claim 1, Column 28; lines 37-67 Column 24-25, Summary of the Preparation Examples, Compounds 15-17). The substituents at the R3 and R4 position are identically disclosed as the instant application. (Column 28, lines 50-60; Claim 1). The substituents R5 and R6 have significant overlap with the instant application. (Column 28, lines 57-67; Claim 1). Pfleiderer et al. discloses substitution of Sulfur and Oxygen at the R6 position as well as the use of protecting groups including silyl groups for oxygen. In particular, alkyl, alkenyl, acetal, S-alkyl, O-Methyl, O-ethyl, O-alkenyl O-allyl, O-acetal and O-tetrahydropyranyl groups are disclosed. (Column 28, lines 37-67, Claim 1; Column 2,

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lines 52-65). Pfeiderer et al. discloses the use of the bases adenine, cytosine and guanine, and the protective groups p-NPEOC and ethylformamidino. (Column 29, lines 30-40, claims 10,11 and 13).

Pfleiderer et al. does not specifically disclose the compound wherein R1 is COOY.

Haugland et al. teaches caged compounds with a photoremovable  $\alpha$ -carboxy-substituted o-nitrobenzyl group (abstract) attached to compounds such as nucleosides or nucleotides (figure 1, compounds 21 and 27 and column 4, lines 45-46) wherein the



photoremovable group is represented by the formula wherein cage substituents R1 and R2, which may be the same or different, are H,  $-(C=O)-Cl$ ,  $-CO_2R_7$ ,  $-OR_8$  or  $-O-(CH_2)_n-CO_2R_7$ , where R7 is H, a linear or branched alkyl ester containing 1-6 carbons, an acetoxymethyl ester ( $-CH_2-O-(C=O)-CH_3$ ), or a succinimidyl ester, or a carboxylate salt (column 3, lines 15-30). Haugland et al. teaches “The careful selection of substituent R7 can be used to modify the solubility properties of the caged product, such as for the purpose of enhancing its uptake by biological cells, or R7 substituents may permit the covalent attachment of the caged molecule to another organic molecule, such as for the purpose of targeting the caged molecule to a specific location or limiting diffusion of the caged molecule...” (column 3, lines 36-42).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the compound disclosed by Pfeiderer et al. with the teaching of

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Haugland et al. of varying the substituent R1 to carboxyl group. Both the inventions of Pfleiderer et al. and Haugland et al. are directed to the field of photoremovable protecting groups. One of ordinary skill in the art would be motivated to combine Pfleiderer et al. in view of Haugland et al. because Haugland et al. teaches the careful selection of substituent R7, part of the group  $-\text{CO}_2\text{R}_7$ , can be used to modify the solubility properties of the caged product, such as for the purpose of enhancing its uptake by biological cells, or R7 substituents may permit the covalent attachment of the caged molecule to another organic molecule, such as for the purpose of targeting the caged molecule to a specific location or limiting diffusion of the caged molecule. One of ordinary skill in the art would have a reasonable expectation of success in combining Pfleiderer et al. in view of Haugland et al. because both inventions are drawn to a photoremovable group with a common core, and Haugland et al. teaches "The photolytic removal of CAGE depends only on the presence of the O-nitrobenzyl moiety and a single benzylic hydrogen atom..." (spanning column 3, lines 66-67 and column 4, line 1). Therefore it would have been obvious to try, selecting from a finite number of identified, predictable solutions, with a reasonable expectation of success to practice the compound wherein R1 is the group COOY.

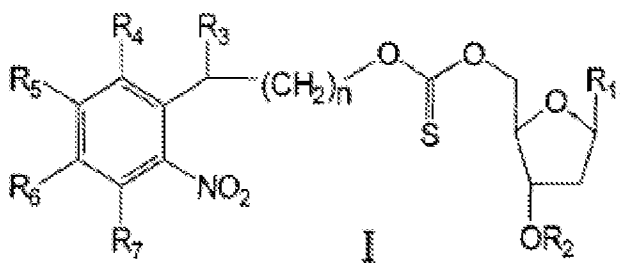
Amended claims 30 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pfleiderer et al. (US Patent 5,763,599, issued 09 Jun 1998, of record) in view of Haugland et al. (US Patent 5,635,608, issued 03 Jun 1997, cited in PTO-892) as applied to claims 30-32 and 34-46 above, and further in view of Berlin (DE19938092,

published 22 Feb 2001, cited in PTO-892). As DE19938092 is published in German, a machine translation of Berlin is provided.

Pfleiderer et al. and in view of Haugland et al. teaches as above.

Pfleiderer et al. and in view of Haugland et al. do not specifically disclose the compound wherein W is S (instant claim 33).

Berlin teaches photo-unstable protecting groups of nucleoside derivatives that that can be split off very efficiently (page 2, lines 4-5 of the machine translation; page 3 lines 39-40 of DE 19938092). Berlin teaches said protecting groups can be manufactured analogous to the esters of carbonic acid (page 2, lines 6-7 of the machine translation; page 3, lines 41-42 of DE 19938092), the compound where W is O according to the formula of instant claim 1. Berlin teaches compounds of represented



by the formula

(DE 19938092, abstract).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the compound taught by Pfleiderer et al. and in view of Haugland et al. with the teaching of Berlin of the compound wherein W is S according to the formula of instant claim 1. All of Pfleiderer et al., Haugland et al. and Berlin are directed to the field of photolabile protecting groups of nucleosides. One of ordinary skill in the art would be motivated to combine Pfleiderer et al. and in view of Haugland et al. with the teaching of Berlin because Berlin teaches use of the thiocarbonic group results in a

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protecting group that can be split off very efficiently. One of ordinary skill in the art would have a reasonable expectation of success in combining Pfeleiderer et al. and in view of Haugland et al. with the teaching of Berlin because of the structural similarities of the compounds and the teaching of Berlin that said protecting groups can be manufactured analogous to the esters of carbonic acid.

### ***Conclusion***

No claim is found to be allowable.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan S. Lau whose telephone number is 571-270-3531. The examiner can normally be reached on Monday - Thursday, 9 am - 4 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shaojia Anna Jiang can be reached on 571-272-0627. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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